REMARKS

This is a full and timely response to the outstanding non-final Office Action mailed March 13, 2006. Through this response, claims 1, 11, and 20 have been amended. Reconsideration and allowance of the application and pending claims are respectfully requested.

Continued Examination Under 37 C.F.R. 1.114

Applicant thanks the Examiner for withdrawing the finality of the previous Office Action and for entering Applicant's submission filed on September 26, 2005.

Claim Rejections under 35 U.S.C. § 103

(a) Claims 1, 7-12, and 15-208 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over *Butler et al.* (U.S. Patent No. 6,589,726) in view of *Lefkowitz et al.* (U.S. Patent No. 6,258,454). Applicant respectfully traverses and incorporates by reference the applicable arguments submitted in its Response of September 26, 2005, as if fully re-stated here in their entirety. In addition, there are several deficiencies of *Butler* and *Lefkowitz* with respect to them rendering independent claims 1, 11, and 20 obvious.

First, *Butler* does not teach/suggest a hydrophobic surface modification layer, as now recited in amended independent claims 1, 11, and 20. Instead, *Butler* recites, "surface tension arrays, which comprise patterned hydrophilic and hydrophobic sites, may be employed. A surface tension array may contain large numbers of hydrophilic sites against a hydrophobic matrix." *Col. 6, lines 11-15* (emphasis added). As described in *Butler* at col. 7, line 47 – col. 8, line 10, its arrays are fabricated by forming separate areas of hydrophobic areas (*i.e.*, "sites") and hydrophilic areas by patterning a substrate. No where does *Butler* teach or suggest that its entire surface has the overall characteristic of being hydrophobic. Although one moiety of the surface modification layers of claims 1, 11, and 20 may be hydrophilic at an individual molecular level, overall the surface modification layers of claims 1, 11, and 20 have the characteristic of being hydrophobic.

Stated another way, the present claims, as amended, recite a surface substrate that has been modified in bulk, not in discrete sites. Although at the atomic scale, the hydrophilic and

hydrophobic moieties are distinct, at the 100 nm scale of synthesis, for example, the entire surface of the substrate has been modified to a certain degree of hydrophobicity. The probe proteins are deposited onto the arrays of claims 1 and 11 onto discrete sites on the substrate, and the size of the probe protein sites will be determined, at least in part, to the hydrophobicity of the substrate surface. Even the Office Action admits that the array of *Butler* has "hydrophilic sites that are spatially segregated by hydrophobic sites (*i.e.*, intervening areas)." *Office Action* at 2, last paragraph. Therefore, *Butler* does not teach or suggest this feature of claims 1, 11, and 20.

Lefkowitz does not cure this deficiency of *Butler*. Indeed, the term "hydrophobic" appears no where in *Lefkowitz*. *Lefkowitz* discloses that "[t]he ratio of the silanes in the derivatizing composition determines the surface energy of the functionalized substrate." *Col. 3, lines 5-7*. It does not appear that *Lefkowitz* expected that by adjusting the ratio of the two silanes of its surface that its surface would have a hydrophobic functionality that would be effective as a surface for protein deposition. One skilled in the art upon trying to create a hydrophobic modified surface would not be motivated to (1) combine *Butler* and *Lefkowitz*, and (2) even if they were combined, would not reach all the features recited in claim 1, which would entail adjusting the ratio of the two moieties of the surface disclosed by *Lefkowitz* to make it hydrophobic. Therefore, claims 1, 11, and 20 are allowable for at least this reason.

Second, and as a separate grounds for patentability of the claims, *Butler* does not teach/suggest "each probe protein...non-covalently attached to the hydrophobic surface modification layer...via hydrophobic-hydrophobic interactions," as now recited in amended independent claims 1, 11, and 20 (emphasis added). Instead, *Butler* recites, "[t]he hydrophilic sites may also support non-covalent attachment to chemical or biological entities, such as molecules, cells, viruses, etc." *Col. 6, lines 31-33* (emphasis added). *Butler* further discloses, "[s]olutions of reactants may be added to hydrophilic sites on the surface..." (col. 10, lines 41-42) and " [t]he hydrophilic sites may be further functionalized, if necessary, for...depositing chemical or biological entities" (col. 7, lines 60-63). In each instance described in *Butler* of its surface being used to deposit chemical or biological entities, the targets are being deposited on the hydrophilic sites. Even the Office Action admits, "solutions of reactants are added to hydrophilic sites." *Office Action* at 3, first paragraph. Therefore, *Butler* does not teach or

suggest non-covalently attaching a probe protein "via hydrophobic-hydrophobic interactions," as recited in independent claims 1, 11, and 20.

Lefkowitz does not cure this deficiency of *Butler*. Indeed, neither the term "protein" nor the phrase "hydrophobic-hydrophobic interactions" appears anywhere in *Lefkowitz*, so it does not teach or suggest non-covalently binding a protein to its surface via hydrophobic-hydrophobic interactions, as recited in claims 1, 11, and 20. As noted in the instant originally-filed specification there are at least four surprising advantages for providing a hydrophobic surface modification layer, *e.g.*, (1) it is "effective as [a] surface[] for protein deposition"; (2) "[t]he hydrophobic nature of the layer binds protein by strong hydrophobic-hydrophobic interactions" (emphasis added); (3) "the functionality on the surface can be used to adjust the surface energy and to provide hydrogen-bonding sites, which in turn would increase the van der Waal interaction of proteins with modified surface"; and (4) "[n]on-specific binding properties of the proteins on hydrophobic surface provide another advantage...the unspotted area can be sufficiently blocked by blocking proteins. This will decrease the background caused by labeled target proteins that non-specifically bind to chemically modified surfaces." *Specification* at paragraph [0095] of corresponding published application, Publication No. US 2005/0095577. These advantages of the protein bioarray of claim 11 and the methods of producing a protein bioarray of claims 1 and 20 are not taught or suggested by the combination of the cited references.

In addition to the forgoing statements in the instant originally-filed specification, Applicants submit herewith the Declarations under 37 CFR 1.132 of the two co-inventors, Dorothy Yang and Magdalena Bynum, in which the inventors describe the advantages of the surfaces of claims 1, 11, and 20 over the surfaces of the cited art. It is respectfully requested that the Declarations be entered and considered with respect to patentability of the present claims.

Thus, claims 1, 11, and 20 are allowable for at least this reason also and Applicants respectfully request that the rejection be withdrawn.

If independent claims 1 and 11 are allowable over the prior art of record, then their respective dependent claims 7-10, 12, and 15-19 are also allowable as a matter of law, because these dependent claims contain all features/elements/steps of their respective independent claims 1 and 11. *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Additionally and notwithstanding the

foregoing reasons for the allowability of claims 1 and 11, these dependent claims recite further features/steps and/or combinations of features/steps (as is apparent by examination of the claims themselves) that are patentably distinct from the prior art of record. Hence, there are other reasons why these dependent claims are allowable.

(b) Claims 2-6 and 13 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over *Butler et al.* in view of *Lefkowitz et al.* and further in view of *Haab et al.* (Genome Biology, 2001). Applicants respectfully traverse. Dependent claims 2-6 and 13 are allowable for at least the same reasons as their respective independent claims 1 and 11. Additionally and notwithstanding the foregoing reasons for the allowability of claims 1 and 11, these dependent claims recite further features/steps and/or combinations of features/steps (as is apparent by examination of the claims themselves) that are patentably distinct from the prior art of record.

(c) Claim 14 is rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over *Butler et al.* in view of *Lefkowitz et al.* and further in view of *Silzel et al.* (Clinical Chemistry, 1998). Applicants respectfully traverse. Dependent claim 14 is allowable for at least the same reasons as claim 11 from which it depends.

CONCLUSION

In light of the foregoing amendments and for at least the reasons set forth above, Applicant respectfully submits that all rejections have been traversed, and/or accommodated, and that the now pending claims 1-20 are in condition for allowance. Favorable reconsideration and allowance of the present application and all pending claims are hereby courteously requested. If, in the opinion of the Examiner, a telephone conference would expedite the examination of this matter, the Examiner is invited to call the undersigned agent at (770) 933-9500.

Respectfully submitted,

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